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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/605,442 | 06/28/2000 | Leon R. Barstad | 50439-2 | 5430 |

7590 08/28/2002

Peter F. Corless
Dike, Bronstein, Roberts & Cushman
EDWARD & ANGELL, LLP
P O Box 9169
Boston, MA 02209

EXAMINER

NICOLAS, WESLEY A

| ART UNIT | PAPER NUMBER |
|----------|--------------|
|----------|--------------|

1741

DATE MAILED: 08/28/2002

14

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|-------------------------------|--------------------------------|--|
| Office Action Summary | Application No. 09/605,442 | Applicant(s) BARSTAD ET AL. | |
| | Examiner Wesley A. Nicolas | Art Unit 1741 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 03 July 2002 and 29 July 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 28-153 is/are pending in the application.
- 4a) Of the above claim(s) 28-123 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 124-153 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413) Paper No(s). <u>12</u> . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) <u>9, 10</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

This is in response to the Amendment dated November 29, 2001 and Amendment dated July 3, 2002, and Terminal Disclaimer filed July 29, 2002. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Claims 28-153 are currently pending in this application.

Election/Restriction

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 28-58, and 91-123, article of manufacture, classified in class 428, subclass 221+.
 - II. Claims 59-90, drawn to a microchip wafer electroplating system, classified in class 204, subclass 242.
 - III. Claims 124-153, drawn to method of plating a semiconductor microchip wafer, classified in class 205, subclass 125.

2. The inventions are distinct, each from the other because of the following reasons:

Inventions I and III are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in a materially different

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process of using that product (MPEP § 806.05(h)). In the instant case, the product can be made using a different deposition process such as electroless plating, PVD, or CVD.

Inventions II and I are related as apparatus and product made. The inventions in this relationship are distinct if either or both of the following can be shown: (1) that the apparatus as claimed is not an obvious apparatus for making the product and the apparatus can be used for making a different product or (2) that the product as claimed can be made by another and materially different apparatus (MPEP § 806.05(g)). In this case the product as claimed can be made by another materially different apparatus such as an apparatus which utilizes electroless, PVD, or CVD plating.

Inventions III and II are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case the apparatus as claimed can be used to practice another and materially different process such as electroless, PVD, or CVD plating.

3. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

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4. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Groups II, or III, restriction for examination purposes as indicated is proper.

5. During a telephone conversation with Peter Corless on July 29, 2002 a provisional election was made **with** traverse to prosecute the invention of Group III, claims 124-153. Affirmation of this election must be made by applicant in replying to this Office action. Claims 28-123 have been withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

6. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a petition under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Terminal Disclaimer

7. The terminal disclaimer filed on July 29, 2002 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of Application No. 09/313,045, has been reviewed and is accepted. The terminal disclaimer has been recorded. As such, there are no double-patenting rejections pertaining to Application No. 09/313,045.

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Claim Objections

8. Claims 138 and 139 are objected to because of the following informalities: in the preamble, "article" should be changed to --method-- as the claims are dependent from method claims and not article claims.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or non-obviousness.

11. Claims 124-138 and 141-153 are rejected under 35 U.S.C. 103(a) as being unpatentable over Creutz (3,770,598), and further in view of Sonnenberg et al. (5,252,196).

Creutz teaches of copper plating using an electroplating composition that comprises at least one water soluble salt (Example 1), one or more brightener

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compounds having a molecular weight of about 1000 or less (col. 3, lines 45-47) and that are present in the concentration of at least about 1.5 mg per liter (Abstract and col. 2, lines 20-27) of the electroplating composition, said brightener comprises a group of the formula $R'-S-R-SO_3X$ where R is optionally substituted alkyl, optionally substituted heteroalkyl, optionally substituted aryl or optionally substituted heterocyclic; and X is a counter ion (col. 4, lines 29-48).

Sonnenberg et al. teach of a copper electroplating process where copper is applied to printed circuit boards.

Both Cruetz and Sonnenberg et al. are silent with respect to the plating of a microchip wafer substrate.

Claims 124 and 137 are rejected because it would have been obvious and within ordinary skill in the art at the time the invention was made to have used the plating composition of Cruetz to plate semiconductor microchip wafers instead of the printed circuit boards as taught by Sonnenberg et al. because both substrates are concerned with electroplating interconnects to conduct electricity, with the only difference being the scale of the interconnect size. Accordingly, one of ordinary skill in the art would have used the teachings of Cruetz and Sonnenberg et al. as a starting point to electrodeposit metal on microchip wafers.

Claims 125-132 are rejected because Cruetz teach that the brightener concentration of about 0.1 to 1,000 mg per liter (Abstract and col. 2, lines 20-27).

Claims 133-134 are rejected because Cruetz teaches of an additional additive which could be used as a suppressor agent (i.e. polyether) (col. 3, lines 48-51).

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It should be noted that it is within the skill in the art to interchange additive terminology such as "brightener", "suppressor", "leveler", etc (see Sonnenberg et al. @ col. 5, lines 34-40). because the capacity at which the additives perform one or more functions is a black art. For example, a typical brightener may act to also perform as a leveler depending on the bath chemistry.

Claim 135 is rejected because Cruetz teaches of a halide ion source such as chloride or bromide ions (col. 5, lines 18-21).

Although Cruetz and Sonnenberg et al. are silent with regards to a microchip wafer substrate, claims 136 and 153 are rejected because Cruetz and Sonnenberg et al. teach that the substrate is attached to a cathode of the system (Cruetz: col. 6, lines 43-50 and Sonnenberg et al.: col. 9, lines 34-45) and it would have been obvious and within the ordinary skill in the art at the time the invention was made to have used semiconductor microchip wafers instead of the printed circuit boards as taught by Sonnenberg et al. because both substrates are concerned with electroplating interconnects to conduct electricity, with the only difference being the scale of the interconnect size. Accordingly, one of ordinary skill in the art would have used the teachings of Cruetz and Sonnenberg et al. as a starting point to electrodeposit metal on microchip wafers.

Claim 138 is rejected because Cruetz teaches a brightener of the formula $XO_3S-Ar-S-S-Ar-SO_3X$ (*i.e.* corresponding to Cruetz formula in claim 10).

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Claim 141 is rejected because Cruetz teaches that the one or more brightener compounds have a molecular weight of about 1000 or less (*i.e.* add up molecular weight of $\text{HSO}_3\text{CH}_2\text{SCH}_2\text{SO}_3\text{H}$ and you get a minimum of 222).

Claims 142-149 are rejected because Cruetz teaches that the brightener concentration of about 0.1 to 1,000 mg per liter (Abstract and col. 2, lines 20-27).

Claims 150-151 are rejected because Cruetz teaches of an additional additive which could be used as a suppressor agent (*i.e.* polyether) (col. 3, lines 48-51).

It should be noted that it is within the skill in the art to interchange additive terminology such as "brightener", "suppressor", "leveler", etc. (see Sonnenberg et al. @ col. 5, lines 34-40). because the capacity at which the additives perform one or more functions is a black art. For example, a typical brightener may act to also perform as a leveler depending on the bath chemistry.

Claim 152 is rejected because Cruetz teaches of a halide ion source such as chloride or bromide ions (col. 5, lines 18-21).

12. Claims 139-140 are rejected under 35 U.S.C. 103(a) as being unpatentable over the Creutz - Sonnenberg et al. combination as applied to claim 137 above, and further in view of Dahms et al. (5,433,840).

The Creutz - Sonnenberg et al. combination are as applied, argued, and disclosed above and incorporated herein but fail to specifically teach a brightener such as 3-mercaptopropane-1-sulfonate.

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Dahms et al. teach the use of a brightener such as 3-mercaptopropane-1-sulfonate (Table 2).

Claim 139 is rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have modified the Creutz - Sonnenberg et al. combination by using the additive of Dahms et al. because Dahms et al. teach the use of a brightener additive such as 3-mercaptopropane-1-sulfonate (Table 2) which strengthens the conductors of circuit boards (col. 1, lines 7-12) thereby providing a more durable interconnect.

Claim 140 is rejected because it would have been obvious and within the ordinary skill in the art at the time the invention was made to have modified the Creutz - Sonnenberg et al. combination by using the additive of Dahms et al. because Dahms et al. teach the use of a brightener additive such as bis-(w-sulfopropyl)disulfide (Table 2) which strengthens the conductors of circuit boards (col. 1, lines 7-12) thereby providing a more durable interconnect.

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Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Wesley Nicolas whose telephone number is (703)305-0082. The examiner can normally be reached on Mon.-Thurs. from 7am to 5pm.

The Supervisory Primary Examiner for this Art Unit is Nam Nguyen whose telephone number is (703) 308-3322.

The fax number for this Group is (703) 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703)308-0661.


NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

Wesley Nicolas

August 27, 2002

| | | | |
|--------------------------|-------------------|----------------|--|
| Interview Summary | Application No. | Applicant(s) | |
| | 09/605,442 | BARSTAD ET AL. | |
| | Examiner | Art Unit | |
| | Wesley A. Nicolas | 1741 | |

All participants (applicant, applicant's representative, PTO personnel):

(1) Wesley A. Nicolas. (3) _____.

(2) Peter Corless. (4) _____.

Date of Interview: 29 July 2002.

Type: a) ☒ Telephonic b) ☐ Video Conference
c) ☐ Personal [copy given to: 1) ☐ applicant 2) ☐ applicant's representative]

Exhibit shown or demonstration conducted: d) ☐ Yes e) ☒ No.

If Yes, brief description: _____.

Claim(s) discussed: 28-153.

Identification of prior art discussed: N/A.

Agreement with respect to the claims f) ☒ was reached. g) ☐ was not reached. h) ☐ N/A.

Substance of Interview including description of the general nature of what was agreed to if an agreement was reached, or any other comments: Mr. Corless agreed to the restriction requirement submitted herewith.

(A fuller description, if necessary, and a copy of the amendments which the examiner agreed would render the claims allowable, if available, must be attached. Also, where no copy of the amendments that would render the claims allowable is available, a summary thereof must be attached.)

i) ☒ It is not necessary for applicant to provide a separate record of the substance of the interview(if box is checked).

Unless the paragraph above has been checked, THE FORMAL WRITTEN REPLY TO THE LAST OFFICE ACTION MUST INCLUDE THE SUBSTANCE OF THE INTERVIEW. (See MPEP Section 713.04). If a reply to the last Office action has already been filed, APPLICANT IS GIVEN ONE MONTH FROM THIS INTERVIEW DATE TO FILE A STATEMENT OF THE SUBSTANCE OF THE INTERVIEW. See Summary of Record of Interview requirements on reverse side or on attached sheet.

Examiner Note: You must sign this form unless it is an Attachment to a signed Office action.

Examiner's signature, if required